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REPORT
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EXCELLENCE IN MATHEMATICS, SCIENCE, AND ENGINEERING EDUCATION ACT OF 1990

AUGUST 1 (legislative day, JULY 10), 1990.—Ordered to be printed

Mr. KENNEDY, from the Committee on Labor and Human Resources, submitted the following

REPORT

[To accompany S. 2114]

The Committee on Labor and Human Resources, to which was referred the bill (S. 2114) to promote excellence in American mathematics, science, and engineering education; enhance the scientific and technical literacy of the American public; stimulate the professional development of scientists and engineers; provide for education, training, and retraining of the nation's technologists; increase the participation of women and minorities in careers in mathematics, science and engineering; and for other purposes having considered the same, reports favorably thereon with an amendment and recommends that the bill as amended do pass.

I. SUMMARY OF THE BILL

TITLE I. NATIONAL GOALS, POLICIES, AND ASSESSMENT

Congress sets forth national policies and objectives in math, science, engineering and technology education. The objectives are to:

—make American students number one in the world in these subjects by year 2000
—encourage students to pursue careers in these fields
—improve the quality of teaching
—increase the number of graduate degrees in relevant fields
—increase women and minority participation

Congress declares this decade the "Decade of Excellence in American Mathematics, Science, and Engineering Education".

Requires the National Science Foundation, in consultation with the Department of Education and with the approval of the Presi-

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dent's Science Advisor, to set forth stated objectives in sufficient detail, collect statistics, sponsor international survey, and submit a final report to the President and the Congress summarizing the extent to which the national objectives have been achieved.

TITLE II. SCIENTIFIC AND TECHNICAL LITERACY OF THE GENERAL PUBLIC

A. Information Dissemination

National Clearinghouse for Science, Mathematics and Technology Education: ($5 million) Establishes a national clearinghouse for the purpose of collecting and disseminating instructional and program materials. Grant awarded by the Secretary of Education, in consultation with the Director of the National Science Foundation.

B. Regional Education Programs

Regional Science and Mathematics Education Consortia: ($19.5 million) Establishes, through competitive grants of five years, at least nine Regional Consortiums, one for each region—

—to disseminate and assist in the implementation of exemplary instructional materials, teaching methods, and assessment tools to elementary and secondary schools;

—to train teachers in precollege math and science instruction;

—to establish a Roving Masters Teacher program whereby highly qualified teachers visit schools throughout a region and conduct special classes for students and teachers;

—to assist State Educational Agencies or Local Educational Agencies in assessing the need for and desirability of specialized academies for talented math and science students;

—to provide financial support so that teachers and other educators can participate in the activities of the Regional Consortium;

—and for other purposes.

Grant recipients must assess the impact and the effectiveness of the programs conducted by teachers and school systems in the region and their success in meeting the needs of schools, students, and educators. They must also establish a regional board to oversee program priorities. The Secretary must submit a report to Congress at the end of each grant period. Grants are awarded by the Secretary of Education, in consultation with the Director of the National Science Foundation. Federal share: 90% for the first and second years; 75% for the third and fourth; 50% from fifth year on.

C. Technology and Learning Center

National Center of Technology and Learning: ($3 million) Establishes a Technology and Learning Center to conduct and disseminate the results of interdisciplinary research on the ways people learn and how technologies can be used to facilitate their learning. Program administered by the Secretary of Education.

D. Informal Mathematics, Science, and Technology Education Programs

Museums, Planetariums, Libraries, and Zoos: ($10 million) Grants will be awarded by NSF to museums, planetariums, libraries, or

zoos for the purpose of developing and disseminating more effective hands-on, interactive activities. Special priority will be given to programs designed to benefit elementary school students.

E. Grants to Local Educational Agencies for Systemic Reform

Systemic Reform: ($19.5 million) Grants will be awarded by NSF to local education agencies for the purpose of making system-wide improvements in math and science education.

TITLE III. EDUCATION OF SCIENTISTS AND ENGINEERS ($51 MILLION)

A. Undergraduate Programs

Centers of Excellence: Grants awarded by NSF to institutions of higher education lacking strong math, science, and engineering departments for the purpose of strengthening their undergraduate teaching in these fields.

National Math and Science Teacher Corps: Awards of $5,000 per year will be given by NSF to promising math or science undergraduates in exchange for two year commitments to teach in Chapter One schools. One two-year commitment of teaching for each one-year award. Maximum of two awards for last two years of degree program, or three if teacher certification not yet earned.

National Science Scholars Program: ($6 million) $5,000 annual scholarships will be awarded by the Secretary of Education, in consultation with the NSF Director, to promising math, science, engineering, or computer science students to enable them to pursue an undergraduate degree. Maximum of four scholarships per student.

B. Graduate Fellowships and Traineeships

National Science Foundation Graduate Fellowships: Increases the number of National Science Foundation Graduate Fellowships to at least 1,200 fellowships per year by Fiscal Year 1993. Strong emphasis on increasing women and minority participation.

Graduate Traineeships: Grants awarded by NSF to institutions of higher education for the purpose of establishing traineeship programs for promising math, science, and engineering students. Strong emphasis on increasing women and minority participation.

TITLE IV. WOMEN AND MINORITIES IN MATHEMATICS, SCIENCE, AND ENGINEERING ($17 MILLION)

Distinguished Visiting Professors: Fellowships awarded by NSF to distinguished women and minority faculty members for the purpose of enabling them to serve as visiting professors at institutions of higher education that lack the resources to attract such distinguished faculty on a permanent basis.

Faculty Awards for Women and Minorities: Grants awarded by NSF to institutions of higher education for the purpose of recruiting and retaining women and minority faculty.

Alliances for Minority Participation: Grants awarded by NSF to institutions of higher education for the purpose of establishing or maintaining partnerships between research universities and insti-

tutions of higher education with predominantly minority enrollment.

TITLE V. FEDERAL LABORATORY EDUCATION PARTNERSHIPS

Requires federal agencies with laboratories involved in science and engineering activities to take some responsibility for preparing the next generation of scientists and engineers. Requires that each agency establish: (a) an education office to administer and coordinate the agency's education activities; (b) undergraduate and graduate education programs; and (c) elementary and secondary education programs.

In addition, federal laboratories are encouraged to establish partnerships with schools to promote science education. The laboratories are authorized to lend employees and equipment to the education efforts. Such funds as may be necessary are authorized for fiscal year 1991 and succeeding years.

TITLE VI. EVALUATIONS AND APPROPRIATIONS

A. Evaluations

Evaluation by the Department of Education: Evaluation of programs and activities authorized by this act to be submitted on September 30, 1995.

Evaluation by National Science Foundation: Evaluation of programs and activities authorized by this act to be submitted on September 30, 1995.

B. Appropriations

Total appropriations: $125 million for fiscal year 1991 and such sums as may be necessary through fiscal year 1995.

II. Legislative History

The bill was introduced by Senator Kennedy for himself and Senators Hatfield, Mitchell, Byrd, Pell, Glenn, Rockefeller, Adams, Bingaman, Dodd, Gore, Inouye, Kerrey, Mikulski, Simon, and Stevens on February 8, 1990, and referred to the Labor and Human Resources Committee.

Prior to introduction, the Committee held exploratory hearings on the status of math, science, and engineering on April 6, 1989, May 3, 1989, June 15, 1989, and November 14, 1989 in Washington, D.C. The Committee held hearings on the legislation on April 19, 1990, and May 18, 1990 in Washington, D.C., and on May 14, 1990 in Boston, Massachusetts. In addition, the Senate Appropriations Subcommittee on Labor, Health and Human Services and Education held a hearing on the legislation on June 9, 1990 in Albany, Oregon.

The Committee met and ordered the bill reported with an amendment in the nature of a substitute and an amendment to the title on July 18, 1990.

III. Background and Need for the Legislation

The Committee is reporting legislation that takes substantial steps to respond to the Nation's need for mathematical and scientific talent and increased knowledge in these fields for the general public. Many have attested to the critical link between economic competitiveness and high ability in mathematics and science. Dr. Carl Sagan, in testimony before the Committee, added a new dimension to our understanding of how vital mathematics and science are to all of us:

> [H]umans are intelligent. That is our hallmark as a species. We are not faster, stronger, better camouflaged, better diggers, better swimmers, et cetera, than all the other animals. What we are better at is thinking. Thinking is our birthright. And the quintessential example of human inquisitiveness, human intellectual ability, is science. There are many others, of course, but science is absolutely key and characteristically human. We use it to understand the universe, to understand our origins, to understand ourselves. *To deprive people of an understanding of science is to deprive them of their birthright, to take away something that is fundamentally human.* (emphasis added)

S. 2114, The Excellence in Mathematics, Science, and Engineering Education Act of 1990, addresses three interrelated aspects of the country's acute demand for mathematical and scientific skills:

—strengthening mathematics and science education at the elementary and secondary school level, both in formal and informal settings;

—meeting projected shortfalls in the number of individuals capable of being employed as mathematicians and scientists; and

—remedying the underrepresentation of minorities and women in these fields.

Our needs in each of these areas must be met.

Elementary and Secondary Education

The evidence of failure in mathematics and science education in our elementary and secondary schools is dismaying. The President and the Governors agreed that one of the national education goals should be to make the country preeminent in worldwide mathematics and science achievement by the year 2000. This goal, in particular, has already been written off by some critics as unachievable. The Committee rejects that position, but acknowledges that attaining that goal will require a sustained commitment on the part of everyone—those within and those outside our educational system.

The National Assessment of Educational Progress (NAEP) shows how little improvement there has been over the past two decades by our elementary and secondary school students in mathematics and science. In mathematics, the scores of 9, 13, and 17 year-old students in 1986 were almost the same as they were in 1973. Although each age group showed some improvement in the 1980s, much of it simply recovered ground lost during the 1970s. In science, the results are even less promising. The 1986 NAEP scores in science for 13 and 17 year-old students were actually lower than

the scores for these age groups in 1970. For 9 year old students, the 1986 scores were virtually identical to the 1970 scores. As in mathematics, the science scores dropped during the 1970s and rose somewhat in the 1980s.

Today's students not only perform poorly in mathematics and science compared to their counterparts in this country some two decades ago, but they also prove themselves to be no match, in nearly every comparison, for students in most developed countries. For example, the International Association for the Evaluation of Educational Achievement's (IEA) examination of science performance of 10 year old students, 14 year-old students, and students in their final year of high school offers a dismal picture of U.S. achievement. Of 15 countries whose 10 year old students were tested, the United States ranked 8th. For 14 year old students, the United States ranked 14th out of 17 countries tested. Results for students taking science in their final year of high school showed that, of the 13 countries tested, the United States was last in biology, 11th in chemistry, and 9th in physics. The IEA concluded, after reviewing the United States' performance in science: "For a technologically advanced country, it would appear that a reexamination of how science is presented and studied is required."

There are many places where elementary and secondary schools appear to fail students in mathematics and science, often steering them away from studying these subjects. Poor mathematics and science teaching in the elementary grades is a critical factor. Problems at the secondary school level include limited mathematics and science course offerings and shortages of qualified teachers.

The introduction to mathematics and science that young students receive in the elementary grades shapes their perceptions of science and determines whether they will be encouraged to pursue these subjects. At the elementary school level, individual teachers typically have responsibility not only for mathematics and science instruction, but the full range of other subjects in the curriculum as well. We may be asking too much of their current level of science knowledge. Many of our elementary school teachers feel they are "not well qualified" to teach science. A 1985-86 survey of science and mathematics education conducted by the Research Triangle Institute found that 23 percent of all elementary school teachers viewed themselves as "not well qualified" to teach physical science, as did 22 percent when it came to teaching earth and space sciences, and 11 percent for life science. A study by the National Science Teachers Association concluded that the average elementary school student receives just 15 minutes of science instruction a day.

Though critical at the elementary school level, the shortcomings of our teaching force in mathematics and science are not limited to that level. The American Association for the Advancement of Science, in its report "Science for All Americans", concluded:

> Few elementary school teachers have even a rudimentary education in science and mathematics, and many junior and senior high school teachers of science and mathematics do not meet reasonable standards of preparation in those fields. Unfortunately, such deficiencies have long been tolerated by the institutions that prepare teachers, the public bodies that li-

cense them, the schools that hire them and give them their assignments, and even the teaching profession itself.

Nevertheless, we have set the difficult challenge to make American students first in the world in math and science by the year 2000. To succeed, we must find ways to turn students on in those subjects at an early age, and build on that enthusiasm throughout school and college. Above all, this means science teaching that succeeds because it adheres to certain fundamental principles that can be summarized in seven key ideas: First, students of all ages must do "hands on" science, not just read about it. Second, curricula must draw on students' everyday lives, so it's easier to see how math and science affect their everyday experiences. Third, the focus must be on fundamental concepts, not facts and rote memorization. Fourth, we must use techniques that encourage inquiry and help children ask their own questions and find their own answers. Fifth, we must emphasize role models—scientists and researchers who can make their disciplines come alive. Sixth, we must do a better job of integrating science into other parts of the school curricula, so that the pervasive role of science is obvious in all disciplines. Finally, teachers and curricula must be sensitive to issues of gender, race, and disability. Stereotyping is wrong in science as in any other field, and it prevents the country from drawing on the full potential of its people.

MATHEMATICS AND SCIENCE PROFESSIONALS

The Nation faces a potential shortage of individuals qualified to practice mathematics and the sciences. The shortage may reach staggering proportions late in this decade or soon after the turn of the century. Our economic and social vitality as a society may depend upon the success of our efforts to overcome this shortage.

Richard C. Atkinson, chancellor of the University of California at San Diego and president of the American Association for the Advancement of Science, put it succinctly in a recent address entitled Supply and Demand for Scientists and Engineers: A National Crisis in the Making:

> [A]ny reasonable analysis of the realities of global competition in today's marketplace should be discomforting in the extreme. The fact that the number of young people selecting science and engineering careers has not increased during a generation in which [science and technology] pervades every aspect of our lives is nothing less than a scandal. (Science, April 27, 1990)

Many of the projections of our future supply of mathematical, scientific, and engineering personnel are frightening. Based on the combined effects of rising demand for new Ph.D.'s in science and engineering (stemming in part from retirements and death), increasing college enrollments late in the decade, and increasing nonacademic need for doctorates, Atkinson projects that the Nation could experience a shortfall of over 150,000 science and engineering doctorates in the period from 1995 through 2010. Perhaps even more disturbing are the projections from the National Science Foundation (NSF). NSF has estimated an overall shortage of 675,000 scientists and engineers by the year 2006.

Many of the difficulties we face in increasing the supply of mathematical and scientific talent arise in our educational system, not only in the elementary and secondary level, but throughout the mathematics, science, and engineering education pipeline. The pipeline has serious leaks. Our educational system fails to capitalize on students' interest and achievement in these fields. Data presented in the Office of Technology Assessment's "Educating Scientists and Engineers: Grade School to Grad School" (1988) reveal the extent of our losses. It is estimated that 13 percent of high school seniors who attend college are interested in majoring in mathematics, science, or engineering. In their first year of college, the level of interest drops nearly by half to 7.4 percent; by the junior year, it's down to 4.8 percent; and it falls to 4.6 percent at college graduation. Finally, only 0.8 percent of the high school seniors who enter college as undergraduates continue their education at the graduate level in the mathematics, science, or engineering fields.

MINORITIES AND WOMEN IN MATHEMATICS AND SCIENCE

The Task Force on Women, Minorities, and the Handicapped in Science and Technology has identified a national dilemma:

> Our pool of talent for new scientists and engineers is predominantly female or minority or disabled—the very segments of our population we have not attracted to science and engineering careers in the past. ("Changing America: The New Face of Science and Engineering," Final Report, 1989.)

What concerns the Committee is that projected new entrants into the labor force between 1988 and the turn of the century have racial, ethnic, and gender characteristics that are dramatically different from the characteristics of currently employed scientists and engineers. According to the National Science Foundation, white males make up approximately 81 percent of all employed scientist and engineers, but the Bureau of Labor Statistics projects that, between 1988 and 2000, only some 32 percent of the new entrants into the labor force will be white males. The Asian representatioin among employed scientists and engineers and among the new entrants in the work force is roughly the same—5 percent of scientists and engineers, a projected 6 percent of the new entrants. The situation is strikingly different for blacks, Hispanics, and white women. Blacks, who are only 2 percent of scientists and engineers, will constitute about 13 percent of the new entrants. Hispanics are also about 2 percent of scientists and engineers; but, they will comprise 15 percent of the projected new entrants. Finally, 10 percent of our current scientists and engineers are white women; in contrast, white women will constitute slightly more than 35 percent of new entrants into the work force in the near future.

The message is clear. This country has traditionally drawn its mathematicians, scientists, and engineers from the pool of white males, resulting in inequities to other populations which can no longer be tolerated. Furthermore, the United States can no longer afford to lose the talent represented by its minorities and women. Not only is increasing their participation in mathematics and science a matter of equity, but our ability to meet the projected shortfalls in these fields is contingent upon successfully preparing mi-

norities and women in mathematics, science, and engineering, and recruiting them into careers in those fields.

The task is daunting. Although the statistics just cited suggest how much needs to be done, data on degrees conferred on minorities, particularly for blacks, in these fields are discouraging. For example, according to U.S. Department of Education, in the 1986–87 academic year, blacks earned 846 bachelor's degrees in mathematics, or 5 percent of the bachelor's in mathematics awarded. At the master's level, blacks earned 76 degrees in mathematics, or 2 percent of master's in mathematics. Only 9 blacks earned doctorates in mathematics in 1986–87, just 1 percent of all mathematics doctorates awarded.

The news is not all dismal. Over the course of the preceding two decades, the gap that separates the average NAEP scores for whites from those of blacks and Hispanics in mathematics and science has shrunk substantially, particularly in mathematics. Still, large gaps remain. For example, in mathematics and science, the average score for black and Hispanic 17 year-old students is almost the same as that for white 13 year-old students. Another bit of good news is that the number of minority students taking academically rigorous Advanced Placement courses has increased dramatically in the last decade.

IV. Committee Views

TITLE I. NATIONAL GOAL AND POLICY FOR MATHEMATICS, SCIENCE AND ENGINEERING EDUCATION

The committee believes that the designation of the 1990s as the "Decade of Excellence in American Mathematics, Science and Engineering Education" must be followed by substantial and sustained efforts if the Nation is to meet the national goal of having American students rank first in the world in mathematics and science by the year 2000. This requires: (a) the provision of the necessary resources to carry out the programs set forth in this Act; (b) a much greater degree of cooperation among the key Federal Departments and agencies; and (c) continuing outreach by the Federal Government to State and local governments, the scientific, engineering, and educational communities, and the private sector.

Section 103 of the bill calls on NSF, the Department of Education, and the Science Adviser to the President to work together to lay out a comprehensive strategic framework for achieving the overall national goals stated within the bill. The Committee would envision that such a strategic plan would contain a clear statement and rational set of priorities and objectives to be achieved coupled with milestones to chart the Nation's progress towards the national goals for the year 2000.

TITLE II. SCIENTIFIC AND TECHNICAL LITERACY

Components of S. 2114 build upon the existing federal program for mathematics and science education at the National Science Foundation and the Department of Education. The National Science Foundation's merit-based math and science education programs are targeted at critical points throughout the entire educa-

tional pipeline—starting at the precollege level with teaching training and materials development, and continuing through the undergraduate, graduate and post-graduate levels. The Dwight D. Eisenhower Mathematics and Science Education Act constitutes the single largest federal investment directed to the improvement of elementary and secondary mathematics and science instruction. Funded in FY 1990 at $135.6 million, its importance is recognized by the Administration, which has proposed a 70 percent increase in its funding for FY 1991.

S. 2114 will strengthen the impact of these programs by (1) encouraging the training of mathematics and science teachers in the critical elementary and middle grades; (2) authorizing the establishment of a national clearinghouse for science, mathematics and technology education materials; (3) creating regional science and mathematics education consortia that develop and disseminate high quality science and mathematics education materials; (4) emphasizing dissemination of resources and assistance for improving mathematics and science education; (5) authorizing support for informal math and science education; and (6) stimulating systemic reforms in math and science education at the local levels.

In particular, the Committee is concerned that many minorities and young women develop an aversion to mathematics or science early in their academic careers. Research has indicated that subtleties in curricular materials or in teaching techniques can create or exacerbate this phenomenon, resulting in fewer females studying in or choosing these fields as careers. It is the Committee's intent that programs in this title and throughout the bill as a whole include efforts to overcome this problem.

SEC. 201. NATIONAL CLEARINGHOUSE FOR SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION MATERIALS.

The Committee is concerned that, unless a special effort is made, many of the initiatives now underway to reform and modify elementary and secondary mathematics and science education programs and materials will not affect the vast majority of students. School administrators, staff and teachers currently have limited means of gaining access to the vast array of materials which have been developed across the country. The problem plagues all levels, including the federal government. Experts have stated that the lack of institutional memory at both the Department of Education and the National Science Foundation has serious implications for the emerging crisis in mathematics and science education.

Therefore, this legislation authorizes the Secretary of Education to award a grant or contract for creation of the National Clearinghouse for Science, Mathematics and Technology Education Materials. The Clearinghouse is to serve as a central repository for all available resource materials on mathematics and science education, with a special emphasis on elementary school teacher preparation materials. The Clearinghouse is to: (1) maintain a permanent repository of science, mathematics and technology education instructional materials and programs, regardless of whether the materials were developed with or without federal assistance; (2) cooperate with relevant federal and non-federal data bases in its activities; (3) disseminate information on these materials and pro-

grams through an on-line computer database, to networks, including the National Diffusion Network and the Educational Research and Information Clearinghouse (ERIC) financed by the Department of Education, and to the regional consortia established by this legislation; and (4) disseminate these materials to the regional consortia and to the public. The Clearinghouse is required to spend the majority of its federal funding for the dissemination of materials.

To ensure that the Clearinghouse will accomplish its objectives, the bill requires any Federal agency or department that has supported or is currently supporting the development of relevant materials and programs to ensure that copies are submitted to the Clearinghouse so that they may be compiled and distributed to the regional consortia. Because of the historic lack of emphasis on dissemination at the National Science Foundation, the Committee has specifically directed the agency to utilize the Clearinghouse as a vehicle for dissemination of its materials and programs.

The Secretary is authorized to determine the application process. The Clearinghouse will receive a grant or contract for a period not to exceed 5 years.

SEC. 211. REGIONAL SCIENCE AND MATHEMATICS EDUCATION CONSORTIA.

In addition to the pivotal role the Clearinghouse will play in disseminating materials and programs, the Committee believes that a comprehensive approach is needed to provide technical assistance to schools implementing changes in their mathematics and science instruction. Therefore, this legislation establishes a national network of regional consortia whose primary purpose is to provide technical assistance to schools and teachers so that they may strengthen or perhaps restructure their instruction in mathematics and science education. The Committee believes that the implementation of exemplary materials and programs will raise the level of science and mathematics literacy of all Americans, promote attainment of higher standards identified by leading educators, and will interest more students, especially women and minorities, in scientific careers.

S. 2114 requires the Secretary of Education, in consultation with the Director of the National Science Foundation, to administer a merit-based competition to award grants or contracts to establish and operate a national network of regional science and mathematics education consortia. One consortium will be funded in each region, as defined by the regions served by the regional educational laboratories supported by the Department of Education. Each consortium is to receive up to $2 million in federal funds. However, if appropriations for this program fall below $4.5 million ($450,000 per consortium), then the Secretary may award grants or contracts of sufficient size, scope and quality to meet the purposes of this legislation.

The FY 1991 authorization level for the regional consortia is $19.5 million and such sums as necessary for FY 1992, FY 1993, FY 1994, and FY 1995. Each consortium will receive a grant or contract awarded for a period not to exceed 5 years, with provisions for review by the Secretary no later than 30 months after the date the grant is awarded. The Committee expects the Department to

make awards under this legislation within twelve months from the date of the enactment.

The central purpose of each regional consortium is to disseminate exemplary science, mathematics and technology education, instructional materials, teaching methods and assessment tools, and to provide technical assistance in the implementation of these programs to the precollege educators within the region. The consortia shall bring state-of-the-art science and mathematics programs to the attention of the nation's classroom teachers and assist them in implementing it in their own classrooms.

Each consortium will assist teachers and other precollege educators to identify exemplary programs and train them in the use of such materials, assessment tools and teaching methods. In addition, consortia shall train classroom teachers to be able to train other teachers in the use of these materials, methods, and assessment tools; work with classroom teachers in adapting these materials, methods and assessment tools to the conditions within their classrooms or regions; help classroom teachers secure content training in mathematics and science instruction; enable highly qualified mathematics and science teachers to be designated as Roving Master Teachers to visit elementary and secondary schools throughout the region to conduct special classes in mathematics and science; and provide financial assistance to enable teachers to participate in the activities of the consortium.

The consortia will also disseminate information on informal science and mathematics materials provided through the Clearinghouse established in this legislation; provide needed technical assistance to state and local educational agencies or consortia thereof to assess the need for or desirability of regional mathematics and science academies; maintain linkages with existing databases and the National Clearinghouse established in this legislation; assist elementary and secondary schools in restructuring science and mathematics instruction and in organizing teacher training programs; and undertake programs to meet the needs of groups, such as women and minorities, who are underrepresented in mathematics and science education.

The consortia will also support the development and dissemination of early childhood instruction materials in mathematics and science and intergenerational projects to train senior citizen volunteers in the implementation of interactive science processes and activities for use by elementary and secondary school students.

The Committee intends that a broad array of organizations and institutions involved in addressing the mathematics and science education needs of our children be eligible to receive funding to operate these consortia. Eligible entities, which must demonstrate expertise in mathematics and science education, include private nonprofit organizations; higher education institutions, including community colleges; elementary or secondary schools; SEAs or LEAs; federally funded regional educational laboratories or research and development centers; or a combination of these entities.

The Committee intends that any regional consortium will undertake activities in its region with the direct assistance of the existing science and mathematics education entities in the region. Any eligible entity applying for assistance should demonstrate that such

a consortium will be used by supplying assurances of participation. To ensure the most effective use of Federal funds, each applicant should describe the efforts it will make to coordinate its activities with those undertaken by the appropriate regional educational laboratory funded under the Department of Education, as well as those educational activities undertaken by Federal laboratories affiliated with the Department of Energy and other agencies.

The Secretary of Education, in consultation with the Director of the National Science Foundation, shall make final selection of the entities to operate regional consortia, while taking into consideration the recommendations of the regional and national peer review panel, or panels, established by the Secretary. The Secretary will establish a peer review panel in each region to conduct the technical review of the applications from that region. The Secretary and the Director will each appoint one-half of the members of each panel who shall reside, to the extent feasible, in that region. Panel members from outside the region may be chosen if candidates are precluded from serving on a panel due to an association with the eligible entity and resulting conflicts of interest. The regional review panels will present their recommendations to the national review panel, established by the Secretary in the same manner. The national review panel will submit final recommendations to the Secretary and Director. Both the regional and national review panels are to include representatives of the science and mathematics education teaching community, SEAs and LEAs, private educators, the higher education community, scientists, engineers, mathematicians and individuals such as women and minorities, who are underrepresented in these fields.

Each applicant must demonstrate (1) expertise in the fields of mathematics and science education; and (2) a plan to implement and disseminate instructional materials, teaching methods and assessment tools. Special emphasis will be given to programs and activities directed to groups underrepresented in mathematics and science, and, moreover, applicants must demonstrate that the business community in the region served by the consortium will play an integral role in the consortium's work.

Each recipient of funds to operate a regional consortium is authorized to establish a broadly-representative regional board to advise on program priorities. Each entity involved in the consortium is to be represented on the board.

To extend the reach of Federal funds for these consortia and to increase the degree of regional commitment to each consortium, each Federal grant will provide up to 90 percent of the costs of a consortium's activities during the first and second years of assistance, 75 percent of the costs during the third and fourth years, and 50 percent in the fifth and any succeeding years. The non-Federal share can be in cash or in-kind, and an emphasis should be placed on securing this match from the business community within the region.

The legislation requires the Secretary of Education, through the Office of Educational Reseach and Improvement, to collect data on the effectiveness of the consortia and to report the impact of the regional consortia to the Congress at the end of each grant period. Such evaluations will include, but will not be limited to, the impact

of the consortia on the science and mathematics programs in schools and school districts in the regions as well as changes in student performance in the impacted programs as measured by achievement, attitudes, aspirations and behavior, and the overall effectiveness of the regional consortia in meeting the needs of the schools, teachers, administrators and students in the region.

SEC. 221. NATIONAL CENTER OF TECHNOLOGY AND LEARNING.

The second half of the twentieth century has been dominated by unparalleled scientific and technical advances that have resulted from research and development (R&D). Much of the economic progress and improvement in the quality of life in recent decades is due to these advances. Consequently, most major corporations routinely make a substantial annual investment in R&D in order to remain competitive. Yet, in a letter to the Committee, the Director of the Congressional Office of Technology Assessment (OTA) stated:

> The percent of research spent on education is a shamefully small fraction of one percent of our education costs. Important to progress in this area is support of research on how we learn, how we retain, integrate and recall information. . . . Research is especially needed on how we can better adopt new learning technologies to meet individual needs.

There have been enormously important advances in the cognitive sciences, computer science, communications technology, information storage and retrieval, and audio-visual technologies. The Committee believes that a concerted, interdisciplinary research program on the processes by which individuals learn and the ways in which advanced technologies can be utilized to facilitate those processes could prove of enormous benefit to the Nation's educational programs. The $3 million authorization for fiscal year 1991 provided for the National Center of Technology and Learning represents a small investment that can reap an enormous return for the Nation's school children. The knowledge gained from this program would be disseminated by the National Clearinghouse to the Regional Consortia for widespread use by teachers and students throughout the Nation. The Committee is well aware that NSF's Research in Teaching and Learning and Applications of New Technologies programs provide support to individuals for research into areas that complement the activities of this new center. The Committee suggests the Department consult with NSF so that the effectiveness of this center can be maximized.

SEC. 231. MUSEUMS, PLANETARIUMS, LIBRARIES AND ZOOS.

S. 2114 authorizes the Director of the National Science Foundation to conduct a competition to award grants to museums, planetariums, libraries, zoos and other science and technology centers or entities to promote increased development of "hands-on" programs and activities in mathematics and science. The legislation emphasizes community outreach with a special focus on programs designed for elementary school-aged children, minority and female childen and economically disadvantaged urban and rural areas. The Committee is especially interested in traveling science exhibits which could be placed in libraries in rural areas, thereby providing an extension of the traditional learning environment. Recipients of

the grants are required to report on these programs and activities to the National Clearinghouse established by this legislation.

SEC. 241. SYSTEMIC REFORM.

In recent years, many educational initiatives have fallen short of reaching their objectives because they focused too narrowly on limited aspects of the educational process, without taking account of their interrelationship with other aspects. The Committee believes it is important that NSF support and help to carry out systemic reform that integrates all relevant elements of the educational process, including: student achievement; organizational structure and decision-making; allocation of adequate resources; recruitment, retention, and professional development of teachers; curriculum improvement; etc. In administering this program, the Committee expects the National Science Foundation to give priority consideration to school districts that emphasize increasing the academic achievement of females and minority students.

All the programs in Title II of this Act are designed to enhance the scientific and technical literacy of the American public. This is essential if the United States is to remain a world-class competitor in the emerging global economy and if our citizens are to enjoy all the benefits of an increasingly technological society.

For these programs to succeed, it is essential that they awaken the interest and stimulate the involvement of American students at an early age in mathematics, science, and technology. The Committee believes that every effort should be made to utilize topics which are inherently interesting to children to stimulate and sustain their interest in mathematics, science, and technology.

One area to which children can readily relate is the control of pollution and the improvement of environmental quality. For example, elementary school children could help sort newspapers and glass bottles for recycling, make field trips to waste disposal sites, examine microorganisms from polluted ponds under the microscope, and conduct relatively simple experiments on using solar energy to heat water.

Another excellent vehicle for awakening student interest is space exploration. For example, the Apple Valley Science and Technology Center in Apple Valley, California is planning to renovate a bus into a space laboratory which will visit schools in the region and permit pupils to conduct experiments within the mobile laboratory as if they were astronauts in orbit. They will then be able to communicate their results to a central computer center just as the astronauts communicate back to their command center.

The use of the computer in this instance is illustrative of its increasingly pervasive role in the educational process. But as OTA noted in its report entitled "Power On! New Tools for Teaching and Learning", only half the Nation's teachers report that they have used computers in instruction [and] few teachers have found ways to exploit the enormous potential which interactive technologies offer.

The Committee encourages the wider introduction and use of computers in teaching mathematics and science in grades K–12. Recognizing the considerable investment required for computer installations, the Committee encourages school systems to seek pri-

vate sector donations of computer equipment. The Committee urges the Department of Education and the National Science Foundation to continue to sponsor research leading to the development of improved software systems for computer aided instruction in mathematics and science throughout grades K–12. And recognizing that many K–12 teachers lack effective computer skills, the Committee urges the Department of Education and the National Science Foundation to give priority attention to programs for training teachers in computer aided instruction in mathematics and science.

TITLE III. EDUCATION OF SCIENTISTS AND ENGINEERS

SEC. 301. CENTERS OF EXCELLENCE.

While it is important to sustain existing institutional excellence throughout the Nation's scientific enterprise, it is also important to strengthen elements of that enterprise in all regions of the Nation. The Nation must not only maintain and enhance the excellence of its best research universities, but it must also aid other geographically dispersed academic institutions in upgrading the quality of their programs in mathematics, science, and engineering. In the 1960s and 1970s, the National Science Foundation (NSF) sponsored "institutional excellence" programs which proved highly successful in aiding many regional universities in achieving significant improvement in their programs. This section is designed to build on that experience and foster the improvement of centers of excellence in these fields in geographically dispersed colleges and universities throughout the Nation. The Committee expects the NSF to give priority consideration to institutions that will educate an increasing proportion of women and minorities in these fields.

SEC. 302. NATIONAL MATHEMATICS-SCIENCE TEACHER CORPS.

One of the best ways to address some of the problems discussed above in this report is by ensuring high quality math and science teachers.

The Nation must produce 300,000 additional mathematics, science, and engineering teachers by the year 2000; 60,000 of the current teachers in these fields in grades K–12 are not fully qualified to teach these subjects. The Committee recognizes that the numbers of college graduates drawn into teaching these subjects through this program will not come close to meeting the Nation's needs. Nevertheless, this program will serve as an important beginning in attracting top students into teaching. In addition, the Committee hopes that it will serve as an inspiration to private foundations and industrial donors to provide private sector funding for similar scholarship programs. The Committee expects the NSF to design this program with the aim of increasing the participation of women and minorities in elementary and secondary school teaching of science and mathematics. The Committee also expects the NSF to design this program so that students who are awarded teaching scholarships do not abuse the program and only those students with a commitment to carrying out the teaching requirement will be allowed to participate.

SEC. 311. NATIONAL SCIENCE SCHOLARS PROGRAM.

By awarding a merit-based college scholarship to one male and one female high school graduate in each congressional district and other U.S. jurisdictions, the Committee wishes to provide a high-visibility incentive to young Americans for the pursuit of mathematics, science, and technology. The Committee notes that although women comprise nearly half of the Nation's workforce, they comprise only 11% of the Nation's scientists and engineers. Accordingly, the equal award of these scholarships between males and females will highlight the importance of increasing female participation in these fields.

The Committee also notes that by the year 2000, one in every three American students will be from a minority background, and by the year 2020, it is estimated that minorities will comprise the majority of students in the U.S.—students who historically have been the least likely to pursue studies in science, mathematics, and engineering. Therefore, the Committee expects the NSF to give special consideration to the selection of minorities in the competition for these scholarships.

PART B—GRADUATE FELLOWSHIPS AND TRAINEESHIPS

The Committee takes special note of the comments of Dr. Richard C. Atkinson who testified before the Committee on behalf of the Association of American Universities on April 19, 1990. He stated, "There are fifteen different studies that examine the issue of the reduction in the supply in science and engineering. [From them] the picture emerges very clearly that between the year 1995 and the year 2010, we are going to have quite a dramatic shortfall of Ph.D.'s in the sciences and engineering." It takes a great deal of time to educate a scientist or engineer. The only way the Nation can begin to cope with the serious shortage which will develop by 1995 is immediately to encourage a significant increase in the number of graduate students in science and engineering.

Section 322 seeks to accomplish this by more than doubling the number of graduate fellowships awarded by NSF. Section 323 aims at the same goal by means of graduate traineeships, which have the advantage of educating students in geographically dispersed institutions throughout the Nation. Fellowships are awarded directly to the student who applies to the institution of his or her choice. Traineeships, on the other hand, are awarded to the institution which can then attract the graudate student by offering him or her financial assistance. They also provide the institution with necessary institutional support to enable the institution to defray a larger share of the costs of educating the graduate student who receives the financial assistance.

The last time NSF supported a broad-based traineeship program was in 1973. However, the Committee is aware of the need to increase the pool of persons with advanced degrees in science and engineering needed by academia, industry and government. Traineeships are a particularly effective way to increase the numbers of graduate students supported, to increase the number of Ph.D.'s, especially in certain critical fields, to strengthen graduate enrollment in science and engineering, to increase institutional capacity to

produce additional Ph.D.'s in science and engineering, and to broaden NSF institutional support of graduate students.

The Committee intends that the Traineeship Program will increase the number and diversity of individuals entering and completing graduate and doctoral programs in mathematics, science and engineering. It should also enhance the capacity of emerging academic institutions which have in the past received relatively limited federal research support but which have demonstrated academic excellence in mathematics, science and engineering.

In awarding both graduate fellowships and traineeships, the Committee expects the NSF to give priority consideration to increasing the participation of women and minority students.

TITLE IV. WOMEN AND MINORITIES IN MATHEMATICS, SCIENCE AND ENGINEERING

Although all the programs in the bill emphasize efforts to increase the participation of women and minorities in mathematics, science, and engineering, this title authorizes programs designed specifically for that purpose. Section 402 is aimed at enabling colleges and universities with otherwise insufficient resources to make awards to outstanding women and minority faculty to serve as Distinguished Visiting Professors. Section 403 is aimed at enabling such institutions to hire women and minority faculty members in these fields on a continuing basis. And Section 404 is aimed at promoting alliances between minority institutions and research universities so that students at the minority institution can benefit to some extent from the faculty, facilities, and programs of the research university.

The programs in Sections 402, 403, and 404 focus on women and minority students at the college level. The Committee decided to concentrate these programs at this level in order to keep the overall authorization level of this Act within budgetary constraints. However, the Committee also recognizes the great importance of programs that stimulate the interest of female and minority students in mathematics and science in grades K-12. Accordingly, the Committee expects the NSF to carry out such programs from funds available through other authorizations. For example, it is extremely important for children to be exposed to role models, such as women and minority scientists and mathematicians who visit their elementary and secondary schools and conduct demonstrations, workshops, and counseling sessions to stimulate interest in these fields.

TITLE V. FEDERAL LABORATORY EDUCATION PARTNERSHIPS

The Federal Government has an enormous resource at its disposal to aid in education in mathematics, science, and technology. This resource consists of the vast network of Federal laboratories with their thousands of scientists, engineers, and technicians and their first-rate facilities and equipment. Departments and agencies that are especially noted for the quality of their laboratories include the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, and Transportation and the Environmental

Protection Agency and the National Aeronautics and Space Administration.

Some examples can convey the vast educational potential available in the Federal Laboratories. Sandia National Laboratories in Albuquerque, New Mexico, the largest of the Department of Energy National Laboratories, provides an excellent example of the Department's commitment to enhancing the science and technical education experiences of our nation's elementary and secondary students. Coordinated through an Education Outreach Steering Committee, Sandia scientists and other technically-trained professionals are active in education outreach at all levels (from kindergarten to post-baccalaureate), across a broad range of constituencies (including women, minorities, and mainstream students), and throughout a broad range of communities (local, state, and national). Existing and planned programs include a Science Advisors Program, which places scientists and engineers in local public schools and state-wide Bureau of Indian Affairs schools; a Math and Science Teaching Ideas Network Database, developed in collaboration with organizations throughout the country; a local School Partnership Program; a state-wide Summer Teacher Training Program; and a national Higher Education-Laboratory partnership aimed at encouraging more minorities and women to pursue careers in science and technology.

Another example involve DOE's Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois. This project is spearheaded by the Director-Emeritus of Fermilab, Dr. Leon M. Lederman, a Nobel Laureate. Under his leadership, Fermilab has made its facilities and personnel available for a voluntary outreach program in mathematics and science education for Chicago school children in grades K-12. In testimony before the Labor Committee on November 14, 1989, Dr. Lederman and his co-project director, Ms. Lourdes Monteagudo, the Deputy Mayor of Chicago for Education, presented a far-reaching proposal for improving mathematics and science teaching in grades K-12. The proposal envisaged the establishment of a "national laboratory" or Academy for training and retraining 15,000 teachers in the Chicago school system in teaching science and mathematics. The core group of master teachers in this new Academy would be supplemented by volunteers from Fermilab and the Argonne National Laboratory.

A final example is the Bay Area Science and Technology Education Collaboration (BASTEC), which involves the cooperation of Lawrence Berkeley Laboratory, Lawrence Livermore National Laboratory, Sandia National Laboratory-Livermore, and Stanford Linear Accelerator Center with the Oakland Unified School District, and community organizations and businesses. BASTEC includes programs for curriculum improvement, and summer workshops and research projects for school teachers. The leader in the development of this project, as well as a principal sponsor in the Westinghouse Science Awards Program, is Dr. Glenn T. Seaborg, a Nobel Laureate and former Chairman of the Atomic Energy Commission.

These pioneering projects demonstrate the leadership and personal commitment of some world renowned research scientists to the education of the Nation's children, as well as the enormous po-

tential for this purpose available from the National Laboratories. Title V aims at expanding the range of such programs by authorizing the national laboratories of all Federal Departments and agencies to participate in education partnerships with universities, secondary schools, and elementary schools.

After receiving testimony on these programs earlier this year, the Committee feels that education partnerships such as those developed by Fermilab, Lawrence Livermore, and Sandia should be encouraged at other federal laboratories.

The Committee also notes that the success of the DOE Laboratory programs is due to the support and commitment of the Secretary of Energy. A similar commitment and a plan for coordinating programs is essential to the success of laboratory education partnerships within other departments. The Committee believes that the establishment or designation of an education office in each of the mission agencies can provide that guidance and support. Research findings indicate that children decide whether or not to pursue mathematics and science disciplines in elementary and secondary school. Fostering and encouraging this early interest and success in math and science can best be enhanced by partnerships between top mathematicians, engineers, and scientists and teachers in local schools and school districts. These parterships are a way in which we can use our research and development infrastructure to help educate the mathematicians, engineers and scientists of tomorrow.

In order to enhance partnerships between labs and education institutions, this Title would establish an education office, or have one designated if it already exists, in each of the mission agencies. The office would oversee and coordinate education programs throughout the department, oversee laboratory education initiatives, and identify the areas of academic study which are critical to the mission of the agency.

Even though many of the federal labs are already involved in local educational efforts, there is little coordination among the programs and even less dissemination of information on effective programs. The agency office would be responsible for coordinating and disseminating information about projects, suggesting partnerships, and highlighting model projects. In addition, the education office would provide model partnership agreements and review agreements proposed by the laboratories.

This title gives federal laboratory directors, in contractor or government operated laboratories, the authority to enter into education partnership agreements with schools, colleges, and universities. These partnership agreements would promote critical academic disciplines at elementary, secondary, undergraduate, and graduate educational levels, while giving special attention to developing mathematical, engineering, and scientific skills in minority and women students.

Federal laboratories may collaborate with schools and colleges to develop education curricula and research projects. They may also provide scientific support services and loan equipment to enhance instruction in math and science technology.

Partnerships may include faculty and staff exchanges and provide resource persons that teach courses or help develop education

programs. In addition, students and faculty from all levels of education could be appointed to, or employed in, summer or academic-year research programs. Partnerships could establish mentorships and assistance for elementary and secondary students—as a part of school curricula or approved extracurricular activities—to promote interest in scientific academic study.

The Committee expects the Federal Departments and agencies to design their programs under this title so as to accord special consideration to the goal of expanding the participation of women and minorities in mathematics, science, and engineering. In addition, the Committee notes that many programs of the National Science Foundation have long been based on the notion of partnerships—partnerships between the research community and the education community. The Committee strongly suggests that federal laboratories look for ways to collaborate with NSF and its grantees to maximize the effectiveness of these federal laboratory partnerships.

The Committee also notes that, while this Act authorizes education partnership agreements for those departments and agencies that receive the bulk of federal research and development funding, other departments or agencies not covered by this Act can contribute to the enhancement of math, science, and engineering education. The Committee hopes that departments or agencies not covered by this Act will pursue similar initiatives.

V. Votes in Committee

S. 2114 was brought up for markup at the Labor and Human Resources Committee Executive Session on July 18, 1990. At that time, Senator Kennedy offered an amendment in the nature of a substitute and a title amendment. The bill as amended was reported favorably from the Committee by a vote of 16 to 0.

VI. Cost Estimate

U.S. Congress,
Congressional Budget Office,
Washington, DC, July 23, 1990.

Hon. Edward M. Kennedy,
Chairman, Committee on Labor and Human Resources,
U.S. Senate, Washington, DC.

Dear Mr. Chairman: The Congressional Budget Office has prepared the attached cost estimate for S. 2114, the Excellence in Mathematics, Science and Engineering Education Act of 1990.

If you wish further details on this estimate, we will be pleased to provide them.

Sincerely,

Robert D. Reischauer.

CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

1. Bill number: S. 2114.
2. Bill title: Excellence in Mathematics, Science, and Engineering Education Act of 1990.
3. Bill status: As ordered reported by the Senate Committee on Labor and Human Resources, July 18, 1990.

4. Bill purpose: S. 2114 would authorize the Department of Education (DoEd) and the National Science Foundation (NSF) to establish certain programs related to mathematics, science, and engineering education. The programs authorized would include a national clearinghouse for science and math education materials, national and regional centers, grants to state and local governments, scholarships, fellowships, and programs to encourage women and minorities to study math and science.

The bill also would require each federal laboratory, such as those run by the Departments of Energy (DOE) and Defense (DoD), to establish an education office and programs to promote science and mathematics education.

5. Estimated cost to the Federal Government:

[By fiscal year, in millions of dollars]

	1991	1992	1993	1994	1995
Estimated authorization level:					
DoEd	34	35	36	38	40
NSF	92	95	99	102	106
Federal Laboratories	5	5	5	6	6
Total estimated authorization	130	135	140	146	153
Estimated outlays	20	98	125	140	145

The costs of this bill would be in budget functions 050, 250, 270, and 500.

Basis of estimate:

For DoEd and NSF, S. 2114 would provide specific authorizations of appropriations for 1991 and such sums as may be necessary each year from 1992 through 1995. The amounts in the table above for 1992 through 1995 are the 1991 authorizations adjusted for inflation. For the programs under the national laboratories, the bill would authorize the appropriation of such sums as may be necessary for 1991 and subsequent years. Based on information provided by DOE, we expect that the national laboratory programs would cost roughly $5 million per year.

For this estimate, we have assumed that the full amounts authorized would be appropriated for each fiscal year. The estimated outlays are based on historical spending patterns.

6. Estimated cost to state and local governments: None.

7. Estimate comparison: None.

8. Previous CBO estimate: None.

9. Estimate prepared by: Michael Sieverts, Peter Fontaine, and Deborah Kalcevic.

10. Estimate approved by: C.G. Nuckols (for James L. Blum, Assistant Director for Budget Analysis).

VII. Regulatory Impact

The Committee has determined that there will be minimal increases in the regulatory burden imposed by this bill.

VIII. Section-by-Section Analysis

Section 1—Provides that this Act may be cited as the "Excellence in Mathematics, Science, and Engineering Education Act of 1990."

Section 2—Provides the table of contents for the Act.

TITLE I—NATIONAL GOAL AND POLICY FOR MATHEMATICS, SCIENCE AND ENGINEERING EDUCATION

Section 101—Presents the Congressional findings concerning the need for the legislation. Declares 5 national objectives: to encourage American students to pursue mathematics, science and engineering careers; to improve mathematics and science instruction; to achieve international preeminence for American students in mathematics and science; to expand the number of degrees awarded in mathematics, science and engineering; and to increase the number of women and minorities pursuing careers in these fields.

Section 102—Declares that it shall be the policy of the United States to improve elementary and secondary performance in mathematics and science; to recognize the value of, and meet the requirements for, preparing sufficient numbers of mathematicians, scientists and engineers; and to devote the resources needed to increase the participation of women and minorities in these fields. Provides that this policy is to be implemented based on certain, specified principles, including that a more effective Federal role requires exchange of information and coordination among the National Science Foundation, Departments of Education, Energy, and Defense, the National Aeronautics and Space Administration, and other relevant Federal agencies.

Section 103—Declares the period from January 1, 1990 through December 31, 1999 as the "Decade of Excellence in American Mathematics, Science and Engineering Education." Makes achievement, by the year 2000, of the objectives specified in Section 101 a paramount national goal of the country. Provides that assessment of progress on, and attainment of, these objectives shall be the responsibility of the National Science Foundation, the Department of Education, and the Science Adviser to the President.

TITLE II—SCIENTIFIC AND TECHNICAL LITERACY

Part A—Information Dissemination in Mathematics, Science and Engineering Education

Section 201—Authorizes the Secretary of Education, in consultation with the Director of the National Science Foundation (NSF), to award a grant or contract for the establishment of a National Clearinghouse for Mathematics, Science and Technology Education. Specifies that the funds awarded are to be used to maintain a permanent repository of mathematics, science and technology education instructional materials and programs; assemble information on all such programs administered by each Federal agency; coordinate with data bases containing relevant curriculum and instructional materials; and disseminate instructional materials and programs. Requires each Federal agency developing relevant instructional materials or programs to submit copies to the Clearinghouse.

Part B—Regional Mathematics, Science and Educational Programs

Section 211—Authorizes the Secretary of Education, in consultation with the NSF Director, to award grants or contracts for the establishment and operation of regional mathematics and science education consortia. Requires one consortium to be established in each region of the country, as defined by the areas served by the Department of Education's (ED) regional education laboratories. Provides that such consortia may, among other specified activities, disseminate information on exemplary precollege instructional materials, teaching methods, and assessment tools in mathematics and science; enable Roving Master Teachers (highly qualified mathematics and science teachers) to visit schools and conduct special classes; assist schools in restructuring instruction in these subjects and organizing teacher training; support activities meeting the needs of those underrepresented in, or underserved by, mathematics, science and technology education; and develop and disseminate instructional materials for early childhood education in mathematics and science. Provides that the Secretary of Education, in consultation with the NSF Director, shall establish a peer review panel in each region to review applications from that region, and a national panel to review the recommendations of the regional panels and make final recommendations for awards to the Secretary and the Director. Limits the Federal share of the cost of each consortium to 90 percent in each of the first two years; 75 percent in the third and fourth years; and 50 percent thereafter. Requires the Secretary to evaluate the effectiveness of each consortium.

Part C—Technology and Learning

Section 221—Authorizes the Secretary of Education to establish a National Center of Technology and Learning, at a higher education institution or nonprofit research organization, for the purpose of conducting of interdisciplinary research on the ways individuals learn and how advanced technology can facilitate learning.

Part D—Informal Mathematics, Science and Engineering Education Programs

Section 231—Authorizes the NSF Director to make grants to museums, planetariums, libraries, zoos, and other science-engineering centers for the development of more effective, hands-on, interactive mathematics, science and engineering activities; and for the dissemination of such activities in the local community, addressing in particular the needs of female and minority children, and poor areas. Requires special consideration in awarding grants for programs for elementary school-aged children.

Part E—Grants to Local Educational Agencies for Systemic Reform

Section 241—Authorizes the NSF Director to make grants to urban and rural LEAs for system-wide improvement in mathematics and science, addressing student achievement, organization and decision-making in the system, resource allocation, professional development of teachers, and curriculum improvement. Provides that priority be given to LEAs placing a strong emphasis on improving achievement among females and minorities.

Part F—Technical Amendment

Section 251—Amends the National Science Foundation Act to include funds for scientific or engineering education among those that can be made available for transfer from other Federal agencies to the NSF.

TITLE III—EDUCATION OF SCIENTISTS AND ENGINEERS

Part A—Undergraduate Programs

Subpart 1—Instruction Improvement

Section 301—Authorizes the NSF Director to make grants to higher education institutions for the establishment of mathematics, science or engineering centers of excellence in institutions not having strong departments in those fields. Provides that priority be given to institutions educating large numbers of women and minorities.

Section 302—Authorizes the NSF Director to establish a National Mathematics-Science Teacher Corps for undergraduates who will commit to teaching mathematics or science in elementary or secondary schools. Limits student eligibility to individuals who are majoring in mathematics, science or engineering; who are in the last 2 years of baccalaureate study; and who are enrolled in an accredited institution. Directs that selection be based on academic merit, with consideration of financial need and the goal of increasing the number of mathematics and science teachers who are minorities, women, or disabled. Sets each annual student award at $5,000; requires each recipient to agree to teach 2 years for each award in an educationally disadvantaged school.

Subpart 2—National Science Scholars Program

Section 311—The Committee found the decline in the number of students pursuing degrees in the physical, life and computer sciences to threaten the very quality—and quantity—of the technological innovation by which America has distinguished itself. The Committee thus finds an immediate need to make a federal commitment to increase the number of trained scientists, mathematicians, and engineers, thereby restoring our preeminence in these disciplines.

Therefore, the Committee establishes a merit-based program entitled the "National Science Scholars Program" to encourage and aid students who have demonstrated outstanding academic achievement at the secondary level to continue a course of study which builds upon their interest and ability in the fields of physical, life and computer sciences, mathematics and engineering. It is the Committee's intent not only to encourge pursuit of study in these fields, but also to emphasize the need for completion and continued training and education.

The National Science Scholars program is to be a joint effort between the Department of Education and the National Science Foundation (NSF) which will require close coordination and cooperation between the two agencies. The NSF will be responsible for convening a board of scientists, mathematicians, educators, engineers and representatives of the business community to recom-

mend to the Director academic criteria for the selection of scholars. The Director in consultation with the Secretary will review the recommendations of the Board and publish the academic criteria in the Federal Register under each agency.

The Director, in consultation with the Secretary, is then required to establish a procedure for nominating between four and ten students from each congressional district and designated insular area. National Science Scholar nominees will be selected for their academic achievement at the secondary level in the life, physical or computer sciences, mathematics or engineering as well as their potential for the successful completion of a postsecondary program in these fields. Consideration will also be given to their motivation to pursue a career in these shortage areas. The Director shall consult with the Board before recommending to the President the names of the scholarship recipients.

The Committee would like to place priority on the entry of these underrepresented groups into the scientific pipeline through the awarding of half of all scholarships to women, and by giving special consideration to the selection of minorities and disadvantaged youth.

The NSF in consultation with the Department of Education will recommend to the President of the United States one male and one female from each congressional district (and eligible insular area) for final selection of the National Science Scholars. The Department of Education will be responsible for the administration of the program and disbursement of the scholarship funds. National Science Scholarship awards will be considered in the computation of federal student financial aid awards.

It is the hope of the Committee that the National Science Scholars program will encourage role models in the defined areas as well as increase the diversity of individuals in these fields.

Section 312—Makes conforming amendments to the Higher Education Act.

Part B—Graduate Fellowships and Traineeships

Section 321—Establishes that the purpose of this part is to address the projected shortage of scientists and engineers by increasing the number of graduate fellowships awarded by the NSF and to create a graduate traineeship program.

Section 322—Authorizes the NSF Director to increase the number of graduate fellowships awarded by the NSF so that at least 1,200 fellowships are awarded in FY 1993 and each succeeding fiscal year. Provides, further, that a substantially increasing number of fellowships shall be awarded to women and minorities in FY 1991 and each succeeding fiscal year through FY 2000.

Section 323—Authorizes the NSF Director to award grants to higher education institutions for traineeship programs encouraging promising students, women and minorities in particular, to continue research and education in mathematics, science and engineering.

TITLE IV—WOMEN AND MINORITIES IN MATHEMATICS, SCIENCE AND ENGINEERING

Section 401—Provides that the purpose of this title is to broaden NSF program activities focused on increasing the participation of women and minorities in these fields.

Section 402—Authorizes the NSF Director to make grants to higher education institutions for awards to distinguished women and minority faculty in these fields. Provides that award recipients shall serve as Distinguished Visiting Professors at institutions lacking the resources to permanently employ faculty of such stature.

Section 403—Authorizes the NSF Director to make grants to higher education institutions, with the exception of research universities, to enable them to employ women and minority faculty in these fields and to obtain necessary research equipment and facilities.

Section 404—Authorizes the NSF Director to make grants to higher education institutions for the establishment or maintenance of alliances between predominantly minority higher education institutions and higher education instititions with high quality research programs in these fields.

TITLE V—FEDERAL LABORATORY EDUCATION PARTNERSHIPS

Section 501—Provides that the purpose of this title is to enhance scientific academic study by having Federal mission agencies identify the areas of study critical to their missions, focusing each agency's resources on promoting education, establishing an office within each mission agency to coordinate scientific academic study programs, and establishing a program of education partnerships between Federal laboratories and education institutions, with special attention to elementary and secondary education and minority and women students.

Section 502—Provides that each mission agency is to establish an education office to administer the programs established under Section 503, oversee the partnerships established under Section 504, and gather and disseminate information on agency programs that promote scientific academic study or development of the scientific and engineering work force.

Section 503—Requires each mission agency to establish at least two programs to make grants to higher education institutions for enhancement of education in critical academic areas through such activities as scholarships, minority research grants, cooperative programs, and institutional support. Provides priority for projects to attract women and minorities into the scientific and engineering work force. Requires each mission agency to establish at least two programs for enhancing the mathematics and science abilities of elementary school faculty and students, through such activities as workshops, seminars, summer employment, science and mathematics resource materials, and outreach programs. Provides priority for projects to attract women and minorities into scientific academic study.

Section 504—Requires each Federal laboratory director to enter into partnership agreements with elementary and secondary

schools, and higher education institutions for furthering scientific academic study at all educational levels. Requires each mission agency to provide model education partnership agreements to the laboratories. Allows such agreements to provide for, among other specified provisions, the distribution of equipment, services, and support to elementary and secondary schools and higher education institutions. Provides that each Federal laboratory director shall make every effort to enter into partnerships with historically black colleges and universities and with other higher education institutions serving Hispanic and other minority populations.

Section 505—Authorizes each mission agency and Federal laboratory to support educational activities in any appropriate location.

Section 506—Requires each mission agency to submit a report, within one year of enactment of the Act, to the Congress and the President describing the activities supported under this title.

TITLE VI—GENERAL PROVISIONS AND AUTHORIZATION OF APPROPRIATIONS

Part A—Evaluation Programs

Section 601—Requires the Secretary of Education to evaluate the programs, activities, and responsibilities of the Secretary under this Act and report to the Congress on September 30, 1995.

Section 602—Requires the NSF Director to evaluate the programs, activities, and responsibilities of the Director under this Act and report to the Congress on September 30, 1995.

Part B—Definitions

Section 611—Defines, for purposes of this Act, the following terms: consortium, critical academic area, Director, education office, education official, elementary school, Federal laboratory, Federal laboratory director, Foundation, informal education, institution of higher education, local educational agency, minorities, mission agency, roving master teacher, scholarship, fellowship, scientific academic study, secondary school, Secretary, State educational agency, and traineeship.

Part C—Authorization of Appropriations

Section 621—Authorizes $5,000,000 for Section 201 for FY 1991 and such sums as necessary for FY 1992 through FY 1995; $19,500,000 for Section 211 for FY 1991 and such sums as necessary for FY 1992 through FY 1995; $3,000,000 for Section 221 for FY 1991 and such sums as necessary for FY 1992 through FY 1995; $10,000,000 for Section 231 for FY 1991 and such sums as necessary for FY 1992 through FY 1995; $19,500,000 for Section 241 for FY 1991 and such sums as necessary for FY 1992 through 1995; $45,000,000 for Section 301, 302, 322, and 323 for FY 1991 and such sums as necessary for FY 1992 through FY 1995; $6,000,000 for Section 311 for FY 1991 and such sums as necessary for FY 1992 through 1995; $17,000,000 for Sections 402, 403, and 404 for FY 1991 and such sums as necessary for FY 1992 through FY 1995; and such sums as necessary for Title V for FY 1991 and subsequent fiscal years.

Section 622—Provides that all funds appropriated under Section 611 shall remain available until expended.

Part D—Effective Date

Section 631—Provides that the provisions of this Act shall be effective on October 1, 1990, or the date of enactment, whichever is later.

IX. Changes in Existing Law

In compliance with rule XXVI paragraph 12 of the Standing Rules of the Senate, the following provides a print of the statute or the part or section thereof of be amended or replaced (existing law proposed to be omitted is enclosed in black brackets, new matter is printed in italic, existing law in which no change is proposed is shown in roman):

Higher Education Act of 1965

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TITLE IV—STUDENT ASSISTANCE

Part A—Grants to Students in Attendance at Institutions of Higher Education

STATEMENT OF PURPOSE; PROGRAM AUTHORIZATION

Sec. 401. (a) * * *

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(b) Secretary Required To Carry Out Purposes.—The Secretary shall, in accordance with [subparts 1 through 8,] *subparts 1 through 9,* carry out programs to achieve the purposes of this part.

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Subpart 1—Basic Educational Opportunity Grants

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Subpart 6—Robert C. Byrd Honors Scholarships Program

STATEMENT OF PURPOSE

Sec. 419A. * * *

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Subpart 7—National Science Scholars Program

PURPOSE

Sec. 419L. (a) It is the purpose of this subpart—

(1) to establish a National Science Scholars Program to recognize student excellence and achievement in the physical, life, mathematics, computer sciences, and engineering;

(2) to encourage role models in physical, life, mathematics, computer sciences and engineering fields for young people by offering opportunities to pursue a postsecondary education in such fields;

(3) to strengthen the leadership of the United States in the fields of physical, life, mathematics, computer sciences and engineering; and

(4) to assist students who have demonstrated outstanding academic achievement in continuing their education in these fields of study.

SCHOLARSHIPS AUTHORIZED

SEC. 419M. (a) PROGRAM AUTHORITY.—(1) The Secretary is authorized, in consultation with the Director of the National Science Foundation (hereinafter referred to as the "Director") and in accordance with the provisions of this subpart, to carry out a program of awarding scholarships for the study of the life, physical, mathematics, computer sciences or engineering.

(2) The Director, in consultation with the Secretary, shall establish and implement a merit-based program for annually awarding scholarships for the study of physical, life, mathematics, computer sciences or engineering to—

(A) one male and one female from each congressional district of the United States, the District of Columbia, and Puerto Rico; and

(B) one male and one female from Guam, the Virgin Islands, American Samoa, Palau, the Republic of the Marshall Islands, the Federated States of Micronesia, and the Commonwealth of the Northern Mariana Islands.

(3) Wherever possible in awarding scholarships, special consideration shall be given to economically disadvantaged students or students from groups traditionally underrepresented in the life, physical, mathematics, computer sciences and engineering professions.

(b) NOTIFICATION OF SECONDARY SCHOOLS.—The Secretary shall notify all public and private secondary schools and all institutions of higher education in each State and in each of the entities set forth in subsection (a)(2)(B) annually of the availability of scholarships under this subpart.

(c) CRITERIA AND PROCEDURE FOR NOMINATION AND SELECTION.—(1) Individuals shall be nominated and selected for scholarships under this subpart on the basis of the student's—

(A) academic achievement in the life, physical, mathematics, computer sciences or engineering;

(B) promise of outstanding academic achievement in physical, life, mathematics, computer sciences or engineering;

(C) potential to successfully complete a postsecondary program in physical, life, mathematics, computer sciences or engineering; and

(D) motivation to pursue a career in physical, life, mathematics, computer sciences or engineering.

(2) The Director, in consulation with the Secretary, shall appoint a National Science Scholars Program Board (hereinafter referred to as the "Board"), composed of scientists, mathematicians, educators, engineers, and representatives of the business community, to—

(A) recommend to the Director specific academic achievement criteria for use in the nomination of scholars; and

(B) make recommendations for awarding scholarships to the Director.

The Director, in consultation with the Secretary, shall review the Board's recommendations and the Director and the Secretary shall each publish the appropriate academic achievement criteria in the Federal Register.

(3) The Director, in consultation with the Secretary, is authorized to establish, either directly or by contract, a procedure for nominating at least 4, but no more than 10 students from each congressional district and from each of the entities set forth in subsection (a)(2)(B), for scholarships under this subpart. The Director shall ensure that such nominations shall be made in consulation with educators, scientists, mathematicians, engineers, and representatives of the business community.

(4) After considering the students nominated under paragraph (3), the Director, in consulation with the Board, shall recommend to the President one male and one female from each congressional district of the United States, and one male and one female from each of the entities set forth in subsection (a)(2)(B), for scholarships under this subpart.

(d) DISBURSAL OF SCHOLARSHIP PROCEEDS.—Scholarship proceeds shall be disbursed by the Secretary on behalf of students who receive scholarships under this subpart to the institutions of higher education at which the students are enrolled. No scholarship proceeds shall be disbursed on behalf of a student until the student is enrolled at an institution of higher education.

(e)(1) NATIONAL SCIENCE SCHOLARS.—Students awarded scholarships under this subpart shall be known as "National Science Scholars".

(2) Students nominated under subsection (c) but not awarded scholarships under this subpart shall be known as "National Science Scholarship Finalists".

(f) NATURE AND AMOUNT OF SCHOLARSHIPS.—(1) Scholarships shall be limited to a maximum of $5,000 per student, per year, for a period not to exceed 4 years.

(2) In the event that funds available in a fiscal year are insufficient to fully fund all awards under this subpart, the amount paid to each student shall be ratably reduced.

(g) USE OF EXCESS FUNDS.—If the funds available under this subpart for any fiscal year exceed the amounts required for initial and continuing awards under this section, additional scholarships may be awarded by the President, in consultation with the Director, to students selected as National Science Scholarship Finalists for the award year.

(h) RELATION TO COST OF ATTENDANCE AND OTHER GRANTS AND SCHOLARSHIPS.—(1) The amount of a scholarship awarded under this subpart shall be reduced by the amount that the scholarship exceeds the student's cost of attendance, as defined in section 472 of the Act.

(2) Notwithstanding any other provision of law, the award made under this subpart shall be considered as income for the purposes of awarding Federal student financial aid.

(i) SPECIAL RULE.—The Director shall encourage the support and assistance of civic groups, the business community, professional as-

sociations, institutions of higher education, and others in providing scholarship assistance to National Science Scholarship Finalists.

(j) ANNOUNCEMENT AND AWARD OF SCHOLARSHIPS.—The selection process shall be completed, and the announcement of the selection of National Science Scholars will be made by the President prior to January 1st of each fiscal year. The Secretary shall notify Members of Congress of selections before the public announcement by the President. Presentation of scholarships shall be made in a public ceremony.

ELIGIBILITY OF SCHOLARS

SEC. 419N. (a) REQUIREMENTS FOR INITIAL AWARD.—To be eligible to receive a scholarship under section 419M, a student shall—

(1) be scheduled to graduate from a public or private secondary school, or to obtain the equivalent of a certificate of graduation (as recognized by the State or entity in which the student resides), during the school year in which the award is made;

(2) be a citizen or national of the United States or the entities set forth in subsection (a)(2)(B), or be an alien lawfully admitted to the United States for permanent residence; and

(3) have applied, or intend to apply, for admission to an institution of higher education in the United States or an institution of higher education in the entities set forth in subsection (a)(2)(B), that is accredited by a nationally recognized accrediting agency or association in accordance with the provisions of section 1201(a) of the Act.

(b) MAINTAINING ELIGIBILITY.—(1) In order to maintain eligibility to receive funds pursuant to a scholarship awarded under this subpart, a student must—

(A) be enrolled at an institution of higher education that is accredited by a nationally recognized accrediting agency or association in accordance with the provisions of section 1201(a) of the Act;

(B) major in any field of physical, life, mathematics, computer science or engineering;

(C) maintain academic performance in good standing, as determined by such institution; and

(D) except as provided in paragraph (2), carry a full-time academic work load, as determined by the institution in which the student is enrolled under standards applicable to all students enrolled in that student's program.

(2) The Secretary shall make exceptions to the requirement under paragraph (1)(D) in the case of a student who—

(A) is on active duty as a member of the armed services;

(B) has a disability or serious injury as certified by a qualified physician; or

(C) has exceptional personal circumstances or emergencies, as determined by the Secretary.

(c) FAILURE TO MEET ELIGIBILITY REQUIREMENTS.—In the event that the student fails to meet the requirements of this section, the student's eligibility to receive further scholarships (or scholarship proceeds) under this subpart shall be determined in accordance with the regulations of the Secretary.

SUMMER EMPLOYMENT OPPORTUNITIES FOR SCHOOLS

SEC. 419O. (a) PRIORITY FOR SUMMER EMPLOYMENT.—To the extent that they are otherwise qualified, students receiving scholarships under this subpart shall be given priority consideration for federally financed summer employment in federally funded research and development centers, that, to the maximum extent practicable, complements and reinforces the educational program of these students.

(b) FEDERAL AGENCY COOPERATION.—Federal agencies shall cooperate fully with the Secretary and participate actively in providing appropriate summer employment opportunities for such students.

EFFECTIVE DATE

SEC. 419P. The amendments made by this subpart shall be effective on October 1, 1990, for award year 1991–1992 and each succeeding award year thereafter.

AUTHORIZATION OF APPROPRIATIONS

SEC. 419Q. There are authorized to be appropriated $6,000,000 for fiscal year 1991, and such sums as may be necessary for each of the fiscal years 1992 and 1993 to carry out the provisions of this subpart.

Subpart [7] *(8)*—Assistance to Institutions of Higher Education

PAYMENTS TO INSTITUTIONS OF HIGHER EDUCATION

SEC. 420. (a) * * *

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Subpart [8] *(9)*—Special Child Care Services for Disadvantaged College Students

SPECIAL CHILD CARE SERVICES FOR DISADVANTAGED COLLEGE STUDENTS

SEC. 420B. (a) * * *

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PART G—GENERAL PROVISIONS RELATING TO STUDENT ASSISTANCE PROGRAMS

DEFINITIONS

SEC. 481. (a) INSTITUTION OF HIGHER EDUCATION.—(1) For the purpose of this title [except subpart 6] *except subparts 6 and 7* of part A and B, the term "institution of higher education includes, in addition to the institutions covered by the definition contained in section 1201(a)—

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TITLE 20—UNITED STATES CODE

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GENERAL EDUCATION PROVISIONS ACT

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SEC. 405. OFFICE OF EDUCATIONAL RESEARCH AND IMPROVEMENT

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(a) DECLARATION OF POLICY; DEFINITIONS

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(4)(A) * * *

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(G) The Secretary shall only award a grant or enter into a contract for a regional educational laboratory if such regional educational laboratory is to be located in the region of the Nation served by such regional educational laboratory.

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TITLE 42—UNITED STATES CODE

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NATIONAL SCIENCE FOUNDATION ACT OF 1950

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SEC. 1869. SCHOLARSHIPS AND GRADUATE FELLOWSHIPS.

The Foundation is authorized to award, within the limits of funds made available specifically for such purpose pursuant to section 1875 of this title, scholarships and graduate fellowships for scientific study or scientific work in the mathematical, physical, medical, biological, engineering, social, and other sciences at appropriate nonprofit American or nonprofit foreign institutions selected by the recipient of such aid, for stated periods of time. Persons shall be selected for such scholarships and fellowships from among citizens [or nationals], *nationals or lawfully admitted permanent resident aliens* of the United States, and such selections shall be made solely on the basis of ability; but in any case in which two or more applicants for scholarships or fellowships, as the case may be, are deemed by the Foundation to be possessed of substantially equal ability, and there are not sufficient scholarships or fellowships, as the case may be, available to grant one to each of such applicants, the available scholarship or scholarships or fellowship or fellowships shall be awarded to the applicants in such manner as will tend to result in a wide distribution of scholarships and fellowships throughout the United States. Nothing contained in this chapter shall prohibit the Foundation from refusing or revoking a scholarship or fellowship award, in whole or in part, in the case of any applicant or recipient, if the Board is of the opinion that such award is not in the best interests of the United States.

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Amend the title of S. 2114 so as to read: *To promote excellence in American mathematics, science and engineering education; enhance the scientific and technical literacy of the American public; stimu-*

late the professional development of scientists and engineers; increase the participation of women and minorities in careers in mathematics, science, and engineering; and for other purposes.

SEC. 1873. EMPLOYMENT OF PERSONNEL.

(a) Appointment; compensation; application of civil service provisions; technical and professional personnel; members of special commissions * * *

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(f) Utilization of appropriations in making contracts.—In making contracts or other arrangements for scientific research *or education*, the Foundation shall utilize appropriations available therefore in such manner as will in its discretion best realize the objectives of (1) having the work performed by organizations, agencies, and institutions, or individuals in the United States or foreign countries, including Government agencies of the United States and of foreign countries, qualified by training and experience to achieve the results desired, (2) strengthening the research staff of organizations, particularly nonprofit organizations, in the United States, (3) adding institutions, agencies, or organizations which, if aided, will advance scientific research, and (4) encouraging independent scientific research by individuals.

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